

Integrating Ethics with the Teaching of Introductory Statistics: Rationale and Resources

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Abstract

Professional codes and mission statements proclaim the importance of ethical statistical practice and serving the public welfare, but it is also worth examining their connections to philosophical ethics as well as how concepts of ethics can motivate and facilitate students' engagement with standard statistics topics (e.g., expected value, distributions, data collection from human subjects). This paper is informed by my recent work: the two-way exchange between statistics and applied ethics in an undergraduate interdisciplinary 3-week ethics module I created for a comprehensive masters university (Lesser & Nordenhaug, 2004), integration of related themes into a full-semester introductory statistics course taken mainly by future elementary and middle school teachers at a research intensive university (Lesser, 2005, 2009), reflections on the ASA's ethical guidelines (Lesser 2012), and my 2008 paper presented at the Technion. Connections may also be possible with distributive ethics (Lesser, 2007) or with diversity and equity issues that have ethical implications (Lesser, 2010).

Key Words: Ethics, interdisciplinary, equity, professional ethics, distributive ethics, philosophy, teaching

1. Implications of Ethical Dimensions of Teaching

1.1 Ethics of Teaching

Gelman and Loken (2012, p. 48) issue this challenge: “To the extent that we believe the general [statistical] advice we give to researchers, the unsystematic nature of our educational efforts indicates a serious ethical lapse on our part...” Most of us (myself included) have indeed been guilty at one time or another of one or more of the following lapses listed by Gelman and Loken: using exams likely low in reliability and validity rather than standardized tests, rarely using pretests (either to adjust for differences between sections or to assess learning gains, evaluating teaching based (largely or only) on student evaluations (with their nonresponse biases), and trying new ideas without randomized experiment or systematic comparisons.

1.2 Implications for the American Statistical Association’s Ethical Guidelines

Lesser (2012) notes that the upcoming revision of the ASA Ethical Guidelines (Committee on Professional Ethics, 1999) provides a valuable opportunity to include ethical dimensions of statistics curricula (e.g., by including “data ethics” material in textbooks), teaching and doing research upon one’s statistics teaching. As an example of the latter, Holcomb (2002) notes that instructors need to consider that students in a treatment group may be concerned that a “new” method could hurt their grades and that students in a control group may feel deprived or assessed without preparation. As another example, Nolen and Vander Putten (2007) note that some traits of action research (where the teacher is also the researcher) are not easily addressed by an institutional review board (IRB), such as whether students (who may be minors) can freely give informed consent, whether a protocol can appropriately be an “emerging” one, and how to best make clear how the research differs from what the student would ordinarily be required to do in the class.

2. Integrating Applied Ethics

To quote its abstract, Lesser and Nordenhaug (2004) describe: “an innovative curriculum module the first author created on the two-way exchange between statistics and applied ethics. The module, having no particular mathematical prerequisites beyond high school algebra, is part of an undergraduate interdisciplinary ethics course which begins with a 3-week introduction to basic applied ethics taught by a philosophy professor (the second author), and continues with 3-week modules from professors in various other disciplines. The first author’s module’s emphasis on conceptual and critical thinking makes it easily adaptable to service-level courses as well as readily expandable for more mathematically sophisticated audiences. Through in-class explorations and discussions, the module made connections to contemporary topics such as the death penalty, equal pay for equal work, and profiling. This article shares examples, resources, strategies and lessons learned for instructors wishing to develop their own modules of various lengths.” In the present proceedings paper, we do not duplicate what is in Lesser and Nordenhaug (2004), but rather give some specific examples that were not in it.

2.1 Connecting Ethical Guidelines and Philosophical Ethical Principles

For example, students who have already been exposed to Kant’s categorical imperative (“act only according to that maxim whereby you can at the same time will that it become a universal law”) certainly have an additional context to discuss the ending of the fifth item of the Nuremberg Code: “No experiment should be conducted where there is an a priori reason to believe that death or disabling injury will occur; except, perhaps, in those experiments where the experimental physicians also serve as the subjects.”

2.2 Connecting Ethical Guidelines to Stories in the News Media

Another way to make the principles in various ethical guidelines come alive is to connect them to articles in the media. For example, the quotation by Miller (2002) in Lesser and Nordenhaug (2004) that notes the ethical importance of “deciding when to stop research participation because of adverse events or clinical deterioration” can be related to how Johnson (2008) notes “The study was stopped early last October when preliminary results showed a higher rate of death in the Trasyolol group.” Another example is comparing the

news that “Companies will post [at clinicalstudyresults.org], on a voluntary basis, both the negative and the positive results of clinical trials completed in the United States in the past two years.” (Ozols, 2004) with this part of Principle #27 of the 1964 Declaration of Helsinki: “Negative as well as positive results should be published or otherwise publicly available.”

2.3 Other Examples

Another way not mentioned in Lesser and Nordenhaug (2004) to combine philosophical ethics and statistics is to compare the costs and benefits of a particular study (as an IRB must do), and this was done by Bragger and Freeman (1999), having students give ratings of five particular studies. Finally, we note that the way Lesser and Nordenhaug (2004) illustrate how statistical concepts and terminology can be readily used to articulate possible answers to “which world is better” (e.g., from the utilitarian criterion of “greatest good for the greatest number”) can be applied to presentations of two or more competing distributions of resources that commonly appear in philosophy books (e.g., Pojman, 1998) and courses.

3. Integrating Other Components with Ethical Dimensions

3.1 Gender Equity and Service Learning

To quote from its abstract, Lesser (2009) describes how “Equity [e.g., gender equity], service learning, and social justice are powerful vehicles for motivating students to take statistics seriously and also for empowering citizens with the statistical literacy needed to be able to speak out more intelligently against injustices they may uncover....A major grant on the author’s campus dealing with gender equity in the context of STEM fields yielded a natural vehicle to implement many aspects of these themes in a redesigned introductory statistics course for pre-service elementary and middle school teachers.” The reader of the present proceedings paper is referred to Lesser (2009) for more detail.

3.2 Equity for Culturally and Linguistically Diverse Learners

To quote from its abstract, Wagler and Lesser (2011) describe “[r]esources, strategies, and lessons learned based on the authors’ research and experience in teaching statistics (especially introductory statistics) to diverse student populations in varied settings.” The reader of the present proceedings paper is referred to Wagler and Lesser (2011) for more detail.

3.3 Distributive Ethics (Social Justice)

The principle of justice has a strong connection to ethical guidelines, such as the Belmont Report: “Individual justice in the selection of subjects would require that researchers...should not offer potentially beneficial research only to some patients who are in their favor or select only “undesirable” persons for risky research.... It can be considered a matter of social justice that there is an order of preference in the selection of classes of subjects (e.g., adults before children) and that some classes of potential subjects (e.g., ...prisoners) may be involved as research subjects, if at all, only on certain conditions.”

It turns out that the question of who gets picked for a study can activate students’ sense of fairness in ways that interact or even interfere with students embracing standard statistical approaches (Lesser, 2008). In particular, some students believe an experiment’s

treatment resources should go to the neediest not the luckiest (Vogt, 2007) and that the respondents of a survey should be determined by choice not chance (Shaughnessy, 2007).

Certain concepts of justice and inequality have great potential power to motivate the real-world importance of statistical analysis. As De Maio (2007, p. 34) laments: “In the minds of many students, statistical analysis bears little relevance to the important issues of the day...[s]tatistical tools which can be used to examine the distribution of income (e.g., the Gini coefficient), the progressivity of tax structures (e.g., the Kakwani index), the nature of poverty (e.g., the Sen index), or health inequities (e.g., illness concentration curves) receive little, if any, attention in most introductory courses...”

Additional examples and reflections are in Lesser (2007), a webinar for CAUSE (July 10, 2007, <http://www.causeweb.org/webinar/teaching/2007-07/>) or for ASA (Nov. 25, 2008 magazine.amstat.org/videos/education_webinars/UsingSocialJusticeExamples.wmv).

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